switchable elements maintain unchanging spatial relationships with one another and with said display.

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 1-21 are in this case. Claims 1-21 have been rejected.

By this amendment, claims 2, 3, 4, 17 and 18 have been canceled and claims 1, 5, 6, 7, 13, 14, 16, and 21 have been amended and claims 22-31 have been added.

Attached herewith is a marked up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with marks to show changes made".

35 U.S.C. 112, First Paragraph, Rejections

The Examiner has rejected claims 14-15 under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention, because the specification fails to teach that by using **one** optical layer with "multiple switchable light rotation elements" (as in claim 14) it is capable of selectively blocking or passing the image light to the appropriate eye. The independent claim 14 has now been amended.

Claim 14 has been amended to eliminate the ambiguous reference to "one optical layer". Claim 14 now refers instead to "a multi-element layer of shutter means". It is noted that the term "shutter means" is explicitly defined in the

definitions section of the specification, and the multi-element nature of the referenced layer of shutter means is clearly described in the specification, particularly with reference to figures 19 and 21.

The Examiner has rejected claim 21 under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was file, had possession of the claimed invention, because the specification fails to teach *an* optical layer having subareas of opaque or transparent.... Claim 21 has now been amended to eliminate the ambiguous reference to "an optical layer". In place of the reference to "an optical layer", claim 21 now refers instead to "a layer of shutter means", which term is defined in the definitions section and described in the specification, particularly with reference to figures 19 and 21.

35 U.S.C. 112, Second Paragraph, Rejections

The Examiner has rejected claims 1-6, 7-13, 14-15, 16-20 and 21 under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. Specifically, the omitted structural cooperative relationships are: between the shutter layer, the first and second light polarizing sublayers, and the sublayer of first and second switchable light rotating means. Claims 2, 3, 4, 17 and 18 have now been canceled. Each of the independent claims 1,7, 14, 16, and 21 has now been amended.

Claims 1, 7, 14, 16, and 21 have been amended to clarify the structural cooperative relationships between the shutter layer, the first and second light

polarizing sublayers, and the sublayer of first and second switchable light rotating means.

Claim 1 now refers to a a layer of shutter means which comprises multiple switchable shutter elements, which elements may be used, in groups of elements, to create alternating first and second subareas of said layer of shutter means. A possible method of constructing such a layer of shutter means, comprising first and second light polarizing sublayers and of a sublayer of multiple on and off switchable light rotating elements positioned between said first and second light polarizing sublayers, is now expressed in new dependant claims 22 and 23.

Claim 7 has similarly been amended to make explicit the required structural cooperative relationships of elements. Subsection (b) of claim 7 describes a layer of shutter means which comprises (i) a first light polarizing sublayer, (ii) a second light polarizing sublayer, and (iii) a sublayer of multiple on and off switchable light rotating elements positioned between said first light polarizing sublayer and said second light polarizing sublayer. Subsection (d) of claim 7 describes use of these switchable light-rotating elements to establish, on said layer of shutter means, first subareas transparent to passage of light and second subareas opaque to passage of light.

Claim 14 has been similarly amended. Claim 14 subsection (c) presents a multi-element layer of shutter means comprising multiple individually switchable elements. New dependant claim 24, dependant on claim 14, specifies that said individually switchable elements are individually switchable light rotating elements. New dependant claim 25, dependant on claim 14, specifies that said multi-element layer of shutter means comprises (a) a first light polarizing sublayer, (b) a second light polarizing sublayer, and (c) a sublayer, positioned between said first light polarizing

sublayer and said second light polarizing sublayer, which comprises said multiple on and off switchable elements, implemented as on and off switchable light rotating elements.

Claim 16 has been similarly amended. Subsection (a) of claim 16 recites a layer of shutter means, which comprises (i) a first light polarizing sublayer, (ii) a second light polarizing sublayer, and (iii) a sublayer of multiple on and off switchable light rotating elements, located between said first light polarizing sublayer and said second light polarizing sublayer. Subsection (c) of claim 16 presents a computing element operable to utilize said multi-line controlling switching means, which control said light rotating elements, to establish within said layer of shutter means first subareas transparent to light and second subareas opaque to light.

Claim 21 has been similarly amended. Step (b) of claim 21 comprises utilizing computing means to select, on a layer of shutter means having multiple switchable shutter elements, multiple sets of contiguous elements of said switchable shutter elements, to function as first subareas, and to select multiple sets of other contiguous elements of said switchable elements, to function as second subareas.

The Examiner has rejected claims 1-21 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention, in particular because the term "substantially" recited in various claims is indefinite since it is not clear to what degree exactly should the term "substantially" be interpreted, and because the phrase "light rotating means" recited in various claims is indefinite since it is not clear what is being rotated. Claims 2, 3, 4, 17 and 18 have now been canceled. Each of the independent claims 1,7, 14, 16, and 21 has now been amended.

The term "substantially" has been eliminated from all claims. Consistent with common practice in this field of art, and with the practice demonstrated by the prior art patents cited by the Examiner, light polarization combinations are now described as being opaque to light or as being transparent to light. Although such combinations are in reality neither entirely opaque nor completely transparent, yet the claim language has been modified so as to be consistent with traditional means for referring to combinations of polarizing and light-turning elements which block light, or which permit light passage.

Use of the phrase "light rotating means" has been modified by separating references to shutter elements used to block light, on the one hand, and references to light rotating means combined with polarizing filters, as a means of constructing such shutter elements, on the other hand.

It is further noted that the phrases "light rotating means", "switchable light rotating means", and "shutter means" are defined, with examples, in the definitions section of the specification, which definitions are here reproduced:

From page 9, line 18:

> "Light rotating means" are also known in the art as "light retarding means" and as "phase retarding means". As used herein, these terms refer in particular to means which change by 90 degrees the orientation of linearly polarized light, or which change the sense of circularly polarized light, converting right-handed polarized light into left-handed polarized light or left-handed polarized light into right-handed polarized light. When the concept 'active or inactive

in light rotation' is used herein in this document and especially in the claims section below it also refers to a situation where in the inactive state the light is rotated m degrees and in the active state it is rotated m + 90 degrees.

From page 9, line 27:

"Switchable light rotating means" are light rotating means whose light rotating effect can be turned on/off under electronic control, as under the Kerr effect. Thus light rotating means is defined 'on' when it rotates light and 'off' when it does not rotate light. Thus, 'on' and 'off' as used herein refers to the presence or absence of the optical phenomenon of light rotating effect, not to the presence or absence of an electrical field which controls the effect. When the phrases 'active/inactive in light rotation' are used herein in this document and especially in the claims section below it also refers to a situation where in the inactive state the light is rotated m degrees and in the active state it is rotated m + 90 degrees.

From page 9, line 36:

"Shutter means": this term is taken to include any means by which particular portions of a screen or layer of material can be made to be substantially transparent, and at other times can be made to be substantially opaque, under the control of switchable means. This might, for example, be accomplished by a unit of switchable light

rotating means (as defined above) sandwiched between two layers of linear polarizing means, both layers oriented in a given same direction. Such an arrangement is opaque or transparent depending on whether the light rotating means is on or off. This example, however, is given for the sake of clarity, yet the nature of the "shutter means" as used herein is not limited to this example nor to any particular technology of shutter means. Thus a solid material having transparent holes which is translated relative to the image as defined hereinabove can also be used as suitable shutter means in some of the embodiments of the present invention.

The Examiner has rejected claim 17 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention, in particular because the phrase "a first and second polarizing sublayers and a sublayer of multiple on and off switchable light rotating means" recited in claim 17 is indefinite. Claim 17 has now been canceled.

35 U.S.C. 102 Rejections

The Examiner has rejected claim 1 under 35 U.S.C. 102 as being anticipated by the patent issued to Isono et al (PN. 5,315,377). Claim 1 has now been amended, so as to more clearly distinguish the present invention over prior art.

The present invention is functionally distinct from that of Isono in that the present invention provides means for aiming of the display system at the eyes of a

user, so as to provide a glasses-free autostereoscopic display which is based on principles of the "parallax barrier", yet which yet does not require a viewer to be in a particular position or at a particular distance from the display in order to see an appropriate image of the stereoscopic image pair in each eye.

This result is made possible by a structural innovation, also distinct from the invention of Isono, which is now specified in the amended version of claim 1, as well as in amended versions of the other independent claims 7, 14, 16, and 21.

Specifically, claim 1 previously referred to a layer of shutter means which comprises multiple switchable shutter elements, said multiple switchable elements being operable to create alternating first and second subareas arranged across and along said layer, which first and second subareas in effect constitute a parallax barrier enabling autostereoscopic display. As pointed out by the Examiner, that description is common to a variety of prior art, including prior art systems cited by the Examiner.

The modified claim 1 now recites the additional restriction that each subarea of the alternating first and second subareas includes a **plurality of contiguous elements** of said switchable shutter elements. In other words, each subarea is constituted by a plurality of switchable elements switched to a common setting. If, for example, the switchable shutter elements are implemented as on and off switchable light-rotating elements sandwiched between polarizing layers, then a subarea is constituted by a plurality of switchable elements switched to be active in light rotation, and an adjacent subarea is constituted by a plurality of switchable light-rotating elements switched to be inactive in light rotation, followed by group of elements switched to be active in light rotation, followed by a group of elements switched to be inactive, and so on. This situation is pictured in explicit detail in figure

19, and discussed in detail in the discussion of figure 19. It is a major functional advantage of the arrangement shown in figure 19 that sets of subareas so constituted can be smoothly and nearly-continuously moved across a shutter layer so constituted, in response to lateral movement of a viewer, but the simple expedient of switching an element on at one extremity of such a subarea, and switching another element off at a second extremity of such a subarea. This process is described in general with reference to the discussion of figure 19 on pages 50-54, and is referred to in detail at lines 23-37 of page 55, as follows:

> It will be appreciated that layer **166** can be constructed similar to layer **111** as described in Figure 19, and that consequently it can be divided into subareas as desired, controlling each of the subareas under electronic control. Thus, the size and spacing of the subareas (as used in Figures 14 and 15) can be adjusted according to the convenience, placement, and personal characteristics and preferences of the viewer.
>
> It may be noted that here, as with the preceding eighth embodiment, the flexibility provided in varying over time the choice of elements involved in each subarea provides great versatility in the use of these elements. For example, rather than simply assigning sets of elements to subareas and then switching the subareas on/off as blocks, as was described in Figures 14 and 15, one might create a light blocking subareas of a particular width,

and then add individual elements to one side of the blocking subarea while removing (inactivating) elements from the other side of the blocking subarea, with the effect of causing the light blocking subarea (or block) to be translated along the layer.

Uses of such a construction to provide accommodation of an autostereoscopic system to a changing position of a viewer is explained in the context of the discussion of figure 24, and in particular from page 57 line 1 to page 58 line 8.

In the amended claim 1, a restriction has been added to the effect that the described apparatus must be operable to create subareas each of which includes a **plurality** of contiguous switchable shutter elements. This condition is in sharp distinction to the constructions described by Isono, by Morishima, and by Imai. The functionally provided by the described construction and claimed by the amended claim 1 cannot be obtained by the constructions described in any of the prior art documents cited by the Examiner.

Isono, for example, in U.S. Patent 5,315,377 in column 2 lines 63-68, refers to the ability of his system to respond to a detected movement of a viewer with respect to a display. He says: "Rarther, the head position of the observer who observes the 3D image is monitored and each time the observer moves to the right or left by only the interval between the pupils, the phase of the parallax barrier of the barrier display section can be inverted." Similarly, in column 5 lines 40-44, he writes "The detecting unit 8 detects the head position of the viewer and generates a display control command to the computer 20 when the head position of the viewer has moved by only

a distance E between the right and left eyes". Note that "E" is defined as the IPD (inter-pupilary distance) of the viewer, as seen in Isono's Figure 2. See also Isono's column 11 lines 50-55:

> "In response to the barrier phase shift command, the computer 20 controls the controller 22 so as to shift the position of the stripe barrier **by a distance corresponding to one image element**" (emphasis supplied).
>
> Thus, even when the head position of the viewer moves by the distance E between both eyes, the image elements R1, R3, R5... can be observed through the aperature slits."

Thus, it may be appreciated that although Isono's system does attempt to compensate and adapt to viewer movement, it cannot accurately respond to a viewer movement of less than a full IPD. Thus Isono's system, in contrast to that of the present invention, cannot respond in a continuous or nearly continuous manner to natural movements of a viewer viewing a display.

In terms of construction of the apparatus, inspection of Isono's figure 2 makes it clear that there exists a one-to-one correspondance between construction elements (e.g., aperatures) of his barrier layer 28 and picture elements on his display layer 46. This is in sharp contrast to the construction portrayed in figure 19 of the present application, and defined by the phrase "plurality of contiguous elements" in claim 1, and of the same or similar phrases in the other independent claims of this application.

Thus, it is believed by the Applicant that the amended claim 1 is allowable, as not being anticipated by Isono.

The Examiner has rejected claims 1-3 under 35 U.S.C. 102 as being anticipated by the patent issued to Morishima et al (Patent No. 5,875,055). Claims 2 and 3 have been canceled. Claim 1 has been amended.

The amended claim 1, described hereinabove with reference to the cited prior art patent of Isono, appears to be patentably distinct from the invention described by Morishita. Certainly it is the case that Morishita's invention does not provide means for finely adjusting at aiming of his apparatus so as to accommodate to the eyes of a viewer who changes position. Structurally as well, Morishita's invention is clearly distinct from that described by claim 1, in that claim 1, as amended, calls for a device operable to establish subareas which comprise a **plurality** of individually switchable elements. Such a construction enables adaptive changes to both size and position of said subareas, yet is absent in Morishima's presentation.

In Morishima's first embodiment, transparent and opaque barrier elements are created by an interaction between a polarizing optical element 2 having fixed sub-elements of fixed polarization orientation (elements 2-A oriented a first way and elements 2-B oriented orthagonally to elements 2-A), and a uniform phase-shift member 30, such as a (non-subdivided) pi cell. See for example column 5 lines 47-48, "The polarization optical element 2 serves as a parallax barrier *with predetermined aperature portions.*" (emphasis added) re the polarizing element. See also column 7 lines 55-59 for a corresponding reference to the phase shift member.

In Morishima's second embodiment, the phase shift member is indeed subdivided, yet the orientation of Morishima's subdivisions is opposite that of the subdivisions contemplated in our specification, and their purpose is different. See Morishima column 10 lines 54-58: "...the pi cell 30 of this embodiment is divided into a predetermined number of portions *in the vertical direction* of the screen, and these portions are independently driven, as shown in FIG. 5." The meaning of the phrase "in the vertical direction" is made unambiguous in Figure 5: the described subdivisions extend horizontally, each crossing the entire width of the phase shift member, such that the subdivisions are placed one above another. This is in contrast to the subdivisions described in our specification and presented in our Figure 19, wherein the subdivisions extend from top to bottom of what Morishima calls a "phase shift member", and consequently subdivide the *horizontal* dimension into multiple portions.

With respect to Morishima's third embodiment, his phase shift member is constituted by two phase shift elements (neither is subdivided), and "other arrangements are the same a as those in the first embodiment" (see column 13 lines 35-36), consequently the discussion hereinabove with respect to Morishima's first embodiment applies equally well to his third embodiment.

In Mirishima's fourth embodiment, presented starting in column 16 line 3, the phase shift elements are indeed divided into a plurality of regions which can be independently driven, yet the structure, orientation, size, and nature, purpose, and possible uses of the subdivisions are wholly different than those described in our specification, which difference has been defined and emphasized in our amended claims.

Each individually switchable element as presented by Morishima in his discussion of his Figures 15A-15C is defines an area wherein either a 2D or a 3D image will be displayed and transmitted. Morishima states explicitly that, in a region for which 3D display has been selected, the method of display of a 3D image within the selected region is that presented by the first, second, and third embodiments discussed above (see column 16, lines 20-38), namely as "a parallax barrier with predetermined aperature portions (see column 5, line 48). As presented by Figure 15A-15C and as discussed by Morishima, each region is sufficiently large to cover a plurality of individual polarizing elements (that is, a plurality of elements 2-A and 2-B, similar to those shown in his Figures 3A and 3B), which elements are of "predetermined aperature portions" (column 5, line 48). There is no suggestion that such a region might be *smaller* than one of said elements, nor would such a construction make any sense in terms of Morishima's announced purpose and described function. Neither is there any suggestion that switching of such a regions might be used to accommodate movement of a viewer.

Thus, switchable elements in Morishima's fourth embodiment serve to determine which areas of a display may be used to present a 2-D image and which areas may be used to present a 3D image, since only those sub-elements of polarizing optical element 2 which received light from appropriately switched sub-elements of element 30 will result in production of a parallax barrier and 3D viewing. Yet, the width of each individual opaque barrier element in the parallax barrier is still fixed and pre-determined, as described with reference to Morishima's first embodiment. See in particular column 5 lines 47-48 and column 7 lines 46-54.

Thus Morishita's description, like that of Isono, does not contemplate a subdivision of his subareas 2-A and 2-B into individually controllable parts, nor can Morishita's device provide for accommodation to changes in position of a viewer, if such changes are of less than a full IPD of distance in a lateral direction.

Thus, since neither in structure nor in function has the invention of the present application, as defined by the amended claims, been anticipated by Morishima, it is believed by the Applicant that the amended claim 1 is allowable, as not being anticipated by Morishita.

35 U.S.C. 103 Rejections

The Examiner has rejected claims 5, 7, 13, 16-17 and 19 under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Morishima et al.

Claim 17 has been canceled. Claim 5 has been amended, and depends on claim 1 which has been amended. Claims 7, 13, and 16 have been amended. Claim 19 depends on claim 16, amended.

Specifically, the Examiner has objected because the stereoscopic image display apparatus taught my Morishima et al, having a polarizer in LCD display and a polarization optical element, served as the first and second light polarizing sublayers, and a phase shift member having multiple on and off switchable polarization rotating regions as shutter means, (with details described for claims 1-3), has met all the limitations of the claims.

It is believed by the Applicant that claim 1, as amended, now describes an invention clearly distinct from the invention described by Morishima, as explained in

detail above in the context of our discussion of the Examiner's 35 U.S.C. 102 rejections. In particular, the provision that the layer of shutter means comprises multiple switchable shutter elements, said multiple switchable elements are operable to create alternating first and second subareas arranged across and along said layer, each subarea of said alternating first and second subareas includes a *plurality of contiguous elements* of said switchable elements, is distinct from the invention described by Morisihma, as pointed out in detail in the discussion of Examiner's 35 U.S.C. 102 rejections.

Therefore, it is believed by the Applicant that claim 5, dependant on claim 1 thus amended, is allowable over Morisihima.

Claim 7 has been amended. Subsection (d) of claim 7 specifies a computing element operable to utilize the multi-line controlling switching means specified in subsection (c) of claim 7 to switch on and to switch off the switchable light rotating elements, components of a layer of shutter means, specified in subsection (b) of claim 7, so as to establish within said layer of shutter means first subareas transparent to passage of light and second subareas opaque to passage of light. Further, according to the amended claim 1, each of said first subareas comprises a plurality of contiguous elements of said switchable light rotating elements, and each of said second subareas comprises a plurality of contiguous elements of said switchable light rotating elements. The uniqueness and the functional advantages of the structure thus described have been pointed out hereinabove in the context of discussion of the Examiner's 35 U.S.C. 102 rejections.

It is believed by the Applicant that the invention described by the modified claim 7 is patentably distinct from the invention described by Morishima, and that

consequently amended claim 7, and amended claim 13 which depends on claim 7, are allowable.

With regard to claim 16 and claims 17 and 19 which are dependant on claim 16, claim 16 has been amended. Subsection (a) of claim 16 recites a layer of shutter means, which comprises (i) a first light polarizing sublayer, (ii) a second light polarizing sublayer, and (iii) a sublayer of multiple on and off switchable light rotating elements, located between said first light polarizing sublayer and said second light polarizing sublayer. Subsection (b) recites a multi-line controlling switching means, each of said multiple switchable light rotating means of each of said sublayer of multiple on and off switchable light rotating means being individually switched on and off by said multi-line controlling switching means, and subsection (c) of claim 16 presents a computing element operable to utilize said multi-line controlling switching means, "*wherein each of said first and said second subareas comprises a plurality of said on and off switchable light rotating means*". As explained hereinabove, it is the Applicant's belief that the amended claim 16, and in particular the portion of amended claim 16 quoted and italicized in the preceding sentence, renders the invention described by claim 16 patentably distinct from the invention described by Morishima. Consequently, the Applicant believes claim 16, and claims 17 and 19 dependant on claim 16, to be allowable over Morishima.

The Examiner has rejected claims 6, 14-15, and 21 under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Morishima et al in view of the patent issued to Isono et al.

Claim 6 depends on claim 1 which has been amended. Claims 14 and 21 have been amended.

Claim 6 depends on claim 1 which has been amended.

It is believed by the Applicant that claim 1 as amended describes an invention clearly distinct from the invention described by Morishima, as explained above in the context of discussion of the Examiner's 35 U.S.C. 35 102 rejections. In particular, the (amended) provision that the layer of shutter means comprises multiple switchable shutter elements, said multiple switchable elements are operable to create alternating first and second subareas arranged across and along said layer, each subarea of said alternating first and second subareas includes a plurality of contiguous elements of said switchable elements, is distinct from the invention described by Morisihma, as pointed out in detail in the discussion of Examiner's 35 U.S.C. 102 rejections.

Therefore, it is believed by the Applicant that claim 6, dependant on claim 1 thus amended, is allowable over Morisihima in view of Isono.

Claim 14 has been amended. Subsection (c) of claim 14 recites a multi-element layer of shutter means interposed between the viewer and the display, said layer of shutter means comprises multiple individually switchable elements, each of said elements being operable in a first mode of operation to prevent passage of light through a portion of said layer, and operable in a second mode of operation to permit passage of light through said portion of said layer. Subsection (d) of claim 14 recites a control module operable to switch selected elements of said switchable elements to said first mode of operation and to switch selected other elements of said switchable elements to said second mode of operation. Subsection (e) of claim 14 recites a calculation module operable to utilize information provided by said eye-locating

module to coordinate sizes and positions of said first and second subregions with selection of *sets of pluralities of contiguous elements of said light-rotating elements* to be in said first mode of operation and of *sets of pluralities of contiguous elements of said light-rotating elements* to be in said second mode of operation.

It is believed by the Applicant that claim 14, as modified, is clearly distinct from the invention described by Morishim et al in view of the patent issued to Isono et al.

Claim 21 has been amended.

Subsection (b) of claim 21 recites utilizing computing means to select, on a layer of shutter means positioned between a viewer and a display and having multiple switchable shutter elements, multiple sets of contiguous elements of said switchable shutter elements to function as first and second subareas. Other subsections of claim 21 describe use of those first and second subareas as a barrier allowing stereoscopic viewing. It is the Applicant's belief that the grouping of contiguous switchable elements of shutter means to form a single switchable subarea of opacity in a stereoscopic barrier system, is neither anticipated nor rendered obvious by Morishima and Isono, and that consequently amended claim 21 is allowable.

The Examiner has rejected claims 8-12 and 20 under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Morishima et al. as applied to claims 7 and 16, and further in view of the patent issued to Isono et al. Claims 8-12 depend from claim 7, which has been amended. Claim 20 depends from claim 16, which has been amended.

The amendment to claim 7, on which claims 8-12 are dependant, has been discussed above in response to the Examiner's other 35 U.S.C. 103(a) objections.

Claim 7 recites an apparatus having a barrier layer of shutter means operable to produce switchably opaque subareas each of which comprises a plurality of contiguous switchable light rotating elements, and to produce switchably transparent subareas each of which also comprises a plurality of contiguous switchable light rotating elements. It is the Applicant's belief that claims 8-12, dependant on claim 7 thus amended, are clearly distinct from the invention described in the patents issued to Morishima et al and to Isono et al, and consequently are allowable.

The amendment to claim 16, on which claim 20 is dependant, has been discussed above in response to the Examiner's other 35 U.S.C. 103(a) objections. Claim 16 recites an apparatus operable to utilize a computing element and switching means to switch on-off switchable light-rotating means of a barrier layer in such a manner that each of first and second (i.e., switchably opaque and transparent) subareas comprises a plurality of said on and off switchable light rotating means.

It is the Applicant's belief that claim 20, based on claim 16 thus amended, is clearly distinct from the invention described in the patents issued to Morishima et al and to Isono et al, and consequently is allowable.

The Examiner has rejected claim 4 under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Morishima et al in view of the patent issued to Imai. Claim 4 has been canceled.

The Examiner has rejected claim 18 under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Morishima et al as applied to claim 16, and further in view of the patent issued to Imail. Claim 18 has been canceled.

Double Patenting

The Examiner has rejected claims 1-3 and 5-6 under 35 U.S.C. 101 as claiming the same invention as that of claims 6, and 12-14 of prior U.S. Patent No. 6,252,707. Claim 1 has been amended. Claims 2 and 3 have been canceled.

The amendment to claim 1 has been presented and discussed hereinabove with reference to the Examiner's 35 U.S.C. 102 and 35 U.S.C. 103 rejections. The Applicant believes that claim 1 as amended is clearly patentably distinct from claims 6 and 12-14 of U.S. Patent No. 6,252,707, and consequently that claim 2, and claims 5 and 6 which depend on claim 1, are allowable over U.S. Patent No. 6,252,707.

The Examiner has rejected claims 1-6 under 35 U.S.C. 101 as claiming the same invention as that of claims 4, 6-7 and 9-10 of prior U.S. Patent No. 5,822,117. Claim 1 has been amended. Claims 2-4 have been canceled.

The amendment to claim 1 has been presented and discussed hereinabove with reference to the Examiner's 35 U.S.C. 102 and 35 U.S.C. 103 rejections. The Applicant believes that claim 1 as amended is clearly patentably distinct from claims 4, 6-7 and 9-10 of prior U.S. Patent No. 5,822,117, and consequently that claims 1, and claims 5 and 6 which depend on claim 1, are allowable over U.S. Patent No. 5,822,117.

Obviousness-Type Double Patenting

In order to overcome the obviousness type double-patenting, Applicant is submitting a Terminal Disclaimer with respect to Patents 6,252,707 and 5,822,117. Withdrawal of these rejections is deemed to be in order and is respectfully requested.

New Claims

In order to further distinguish the claimed invention from prior art systems cited by the Examiner, additional claims 22-31 have been added. New claims 22-25 have been referred to above in the context of the preceeding discussion of the Examiner's 35 U.S.C. 112, Second Paragraph, rejections. In particular, new claims 22 and 23 are referred to in context of a discussion of amended claim 1, on which they depend, and new claims 24 and 25 are referred to in context of a discussion of amended claim 14, on which they depend.

New claim 26 also depends on amended claim 14. New claim 26 makes explicit the adaptability of the described system to various positions of a viewer with respect to a display, and to various distances of a viewer from the display. Support for new claim 26 is found generally in the discussion of Figures 23 and 24, to be found between page 56 line 12 and page 58 line 8. Note in particular Figure 24, which presents a mathematical formulation of the required geometrical relationships, suitable for calculating positions of subregions and subareas as defined. Note also in particular the following, from page 57 line 35 of the specification: "In similar manner, given information about the position of the eyes, the size and position of the display, and the position and orientation of shutter layer 90, one can calculate the sizes and positions for the subareas into which shutter layer 90, and the image being displayed on display1, must be divided."

Support for new claims 27, 28, and 29 is also to be found in the discussion of Figures 23 and 24, noted in the previous paragraph, together with the discussion of Figures 18 and 19 previously cited. It is clear from the discussion of the physical mechanism presented in Figures 18, 19, and 21, together with the discussion of the

proposed useage of that mechanism as presented with reference to Figures 23 and 24, that the system described constitutes a computer-controlled parallax barrier having, at a given time, transparent subareas and opaque subareas. Figure 19, in particular, shows that each transparent subareas is adjacent to at least one opaque subarea. The discussion of Figure 19 shows in detail how elements of a mechanism may be switched in a manner which causes subareas of that parallax barrier to be expanded or contracted or moved, and the discussion of Figures 23 and 24 *op. cit.* show in detail how that parallax barrier may be operated to vary both size and placement of the transparent subareas and of the opaque subareas, under computer control, so as to maintain three-dimensional viewing of the display while a viewer moves laterally with respect to the display, and while a viewer changes distance from a display. With respect to movement of a view towards or away from a the display, note in particular the following, from page 57 line 35 of the specification: "In similar manner, given information about the position of the eyes, the size and position of the display, and the position and orientation of shutter layer 90, one can calculate the sizes and positions for the subareas into which shutter layer 90, and the image being displayed on display1, must be divided."

As was previously noted in the context of our response to Examiner's 35 U.S.C. 102 rejection of claim 1, neither Isono's invention nor that of Morishima is capable of modifying the size of the transparent and opaque subareas of the parallax barriers created by their systems. Consequently, the inventions described by claims 27, 28, and 29 are distinct from those described by Isono and by Morishima. For detailed demonstration of this limitation of those prior art systems, the Examiner is referred to our discussion of the 35 U.S.C. 102 rejections, above.

Support for new claim 29 may be found, in particular, in the discussion of the mathematical relationships presented by Figure 24. New claim 29 further distinguishes the claimed invention from prior art by making explicit the fact, implied by the calculation referred to in the above quoted sentence from page 57 line 35 of the specification, that the ratio of the width of a subarea, as defined, to the width of a subregion, as defined, is variable under the system described in our specification. As has been noted above, variability of this ratio is not a feature of the design presented by Isono, nor of the design presented by Morishima.

New claim 30 seeks to further distinguish the claimed invention from prior art by emphasizing another aspect of the claimed invention which is patentably distinct from the cited prior art, namely the fact that our invention does, and the cited prior art inventions do not, present a barrier construction wherein individual switchable elements may be so switched as to be grouped, at a first time, as a first set of elements together constituting a first selected subarea (or set of subareas) with a common optical property such as transparence or opacity, and those individually switchable elements may be so switched as to be grouped, at a second time, as a second set of elements together constituting a second selected subarea (or set of subareas) having a common optical property such as transparence or opacity, and that the first selected set of elements and the second selected set of elements may be chosen so as to have some, none, or all elements in common. Support for claim 30 is to be found in particular with reference to the discussion of Figure 19, and in particular in the demonstration that a subarea may be moved or changed by e.g. turning on a first switchable element contiguous to a subarea composed of 'on' elements, thereby associating that first switchable element with that existing 'on'

subarea, thereby enlarging that subarea, or by turning off a second subelement which had been on, thereby disassociating that second element from said 'on' subarea, thereby shrinking that subarea, or by doing both, thereby causing that subarea to be translated sideways Note, for example, the discussion of such a procedure on page 55, lines 23-37, quoted below:

> It will be appreciated that layer 166 can be constructed similar to layer 111 as described in Figure 19, and that consequently it can be divided into subareas as desired, controlling each of the subareas under electronic control. Thus, the size and spacing of the subareas (as used in Figures 14 and 15) can be adjusted according to the convenience, placement, and personal characteristics and preferences of the viewer. It may be noted that here, as with the preceding eighth embodiment, the flexibility provided in varying over time the choice of elements involved in each subarea provides great versatility in the use of these elements. For example, rather than simply assigning sets of elements to subareas and then switching bhe subareas on/off as blocks, as was described in Figures 14 and 15, one might create a light blocking subareas of a particular width, and then add individual elements to one side of the blocking subarea while removing (inactivating) elements from the other side of the blocking subarea, with the effect of causing the light blocking subarea (or block) to be translated along the layer.

New claim 31 seeks to further distinguish the claimed invention from prior art by emphasizing another aspect of the claimed invention which is patentably distinct from the cited prior art, namely the fact that our invention, but not the cited prior art inventions, presents an autostereoscopic parallax barrier display system for viewing stereoscopic 3D displays, which system is operable to modify the barrier (subareas') and display element (subregions') geometry so as to adapt the system to small lateral position changes of a viewer with respect to a display, thereby preserving viewablility of the autostereoscopic display under conditions of normal user movement. This capacity is wholly lacking in the systems presented by Isono and by Morishita, as pointed out hereinabove in the context of our discussion of the Examiner's 35 U.S.C. 102 rejections. For the Examiner's convenience, several specific references to Isono's Patent are repeated in the following:

Isono, for example, in U.S. Patent 5,315,377 in column 2 lines 63-68, refers to the ability of his system to respond to a detected movement of a viewer with respect to a display. He says: "Rather, the head position of the observer who observes the 3D image is monitored and each time the observer moves to the right or left by only the interval between the pupils, the phase of the parallax barrier of the barrier display section can be inverted." Similarly, in column 5 lines 40-44, he writes "The detecting unit 8 detects the head position of the viewer and generates a display control command to the computer 20 when the head position of the viewer has moved by only a distance E between the right and left eyes", ("E" is defined as the IPD (inter-pupilary distance) of the viewer, as seen in his figure 2.) And again, in column 11 lines 50-55: "In response to the barrier phase shift command, the computer 20 controls the controller 22 so as to shift the position of the stripe barrier **by a distance**

corresponding to one image element" *(emphasis supplied)*. Thus, even when the head position of the viewer moves by the distance E between both eyes, the image elements R1, R3, R5... can be observed through the aperature slits."

Further references to Isono's patent, relevant to this context, are to be found above in the context of our discussion of the Examiner's 35 U.S.C. 211 rejections of claim 1 as being anticipated by Isono.

Similarly, our discussion above, answering the Examiner's 35 U.S.C. 211 rejections of claim 1 as being anticipated by Morishima, shows clearly that the Morishima's system is unable to "adapt to a change in lateral position of a viewer with respect to said display, said change of position being of a lateral distance of less than one IPD of said viewer" (language from claim 31), as demonstrated for example by the previously quoted section from Morishima, column 5 lines 47-48, "The polarization optical element 2 serves as a parallax barrier *with predetermined aperature portions*..."

For other quotations and further discussion on the same subject, the Examiner is referred to the above discussion of claim 1 with respect to Examiner's 35 U.S.C. 211 rejections of claim 1 as being anticipated by Morishima.

Support for the claimed description of the presented system as comprising a display and a parallax barrier, being operable to adapt to a change in lateral position of a viewer with respect to the display, the change of position being of a lateral distance of less than one IPD of the viewer, and adaptable electronically, having no moving parts, is provided throughout the discussion of Figures 23 and 24, in view of the discussion of Figures 18, 19, and 21.

In view of the foregoing, it is believed this application is now in condition for allowance, and an early notice of allowance is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

An early and favorable action is therefore respectfully requested.

Respectfully submitted,

Sol Sheinbein
Registration No. 25,457

Date: March 4, 2003

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claim 1 has been amended as follows:

1. (Amended) A system for three-dimensional viewing of a display, the display presents a frame, the frame includes first subregions and second subregions distributed across and along the frame, the first subregions alternately present first and second picture elements of a left image and a right image, respectively, while at the same times, the second subregions alternately present corresponding second and corresponding first picture elements of the right image and the left image, respectively, the system comprising:

(a) a layer of shutter means ~~including~~which comprises multiple switchable shutter elements, said multiple switchable elements are operable to create alternating first and second subareas ~~being~~ arranged across and along said layer, each subarea of said alternating first and second subareas includes a plurality of contiguous elements of said switchable elements, wherein in a first phase of operation, said first subareas are ~~substantially~~ opaque and said second subareas are ~~substantially~~ transparent, whereas in a second phase of operation said first subareas are ~~substantially~~ transparent and said second subareas are ~~substantially~~ opaque, said layer of shutter means being in a distance from the display and said first and second subareas being distributed across and along said layer of shutter means, such that in said first phase of operation, light emanating from the first subregions reaches the one of the eyes of the viewer and is ~~substantially~~ blocked from the other eye and light emanating from the second subregions reaches the other eye of the viewer and is ~~substantially~~ blocked from the first eye, whereas in said second phase of operation, light emanating from the first

subregions reaches the other eye of the viewer and is ~~substantially~~ blocked from the first eye and light emanating from the second subregions reaches the first eye of the viewer and is ~~substantially~~ blocked from the other eye; ~~and~~

(b) a coordinating element coordinating between rates of selecting said first and second phases of operation and between alternately presenting the first and second picture elements of the left and right images in the first and second subregions, such that when said first phase of operation is selected, the first picture elements are presented in the first subregions and the second picture elements are presented in the second regions, whereas when said second phase of operation is selected, the second picture elements are presented in the first subregions and the first picture elements are presented in the second regions; and

(c) a multi-line controlling switching means operable to select a plurality of sets of contiguous elements of said multiple switchable shutter elements to function as said first subareas and to select a plurality of sets of contiguous elements of said multiple switchable shutter elements to function as said second subareas,

wherein, the system being adjustable to varying positions and distances of the eyes of a viewer relative to said display, so as to maintain three-dimensional vision.

Claim 5 has been amended as follows:

5. (Amended) A system for three-dimensional viewing as in claim ~~3~~1, further comprising additional layers of shutter means being between the display and a viewer and being controlled by said multi-line controlling switching means.

Claim 6 has been amended as follows:

6. (Amended) A system for three-dimensional viewing as in claim ~~3~~1, further comprising means for sensing said position and said distance of the viewer relative to the display.

Claim 7 has been amended as follows:

7. (Amended) A system for three-dimensional viewing of a display by a viewer, the system comprising:

(a) a display operable to present picture elements of a left image in first subregions of variable ~~selected size and~~ position on said display, and to present picture elements of a right image in second subregions of variable ~~selected size and~~ position on said display;

(b) at least one layer of shutter means positioned between said display and said viewer, said layer of shutter means comprises~~including~~:

~~a first and a second light polarizing sublayers and a sublayer of multiple on and off switchable light rotating elements located between said first and said second light polarizing sublayers;~~

(i) a first light polarizing sublayer;

(ii) a second light polarizing sublayer; and

(iii) a sublayer of multiple on and off switchable light rotating elements positioned between said first light polarizing sublayer and said second light polarizing sublayer;

(c) a multi-line controlling switching means, each of said multiple switchable light rotating means of each of said at least one sublayer of multiple on and

off switchable light rotating means being individually switched on and off by said multi-line controlling switching means;

(de) a computing element operable to utilize said multi-line controlling switching means to switch on and off said switchable light rotating elements so as to establish within said layer of shutter means first subareas ~~substantially~~ transparent to passage of light and second subareas ~~substantially~~ opaque to passage of light, wherein each of said first subareas comprises a plurality of contiguous elements of said switchable light rotating elements, and each of said second subareas comprises a plurality of contiguous elements of said switchable light rotating elements, said first and said second subareas being distributed across and along said layer of shutter means in such a manner that light emanating from said first subregions reaches the left eye of a viewer and is ~~substantially~~ blocked from the viewer's right eye, and light emanating from said second subregions reaches the right eye of the viewer and is ~~substantially~~ blocked from the viewer's left eye;

wherein, the system being adjustable to varying positions and distances of the eyes of a viewer relative to said display, so as to maintain three-dimensional vision.

Claim 13 has been amended as follows:

13. (Amended) The system of claim 7, further comprising a plurality of said layers of shutter means.

Claim 14 has been amended as follows:

14. (Amended) A system for providing to a viewer stereoscopic viewing of a left image and a right image, comprising:

(a) a display operable to present a frame which includes at any given time first subregions and second subregions distributed across and along said frame, said first subregions ~~being of selected size and position and~~ presenting picture elements of a left image, said second subregions ~~being of selected size and position and~~ presenting picture elements of a right image;

(b) an eye-locating module operable to determine and report eye positions of said viewer with respect to said display;

(c) ~~at least one optical layer~~ a multi-element layer of shutter means interposed between said viewer and said display, said ~~optical layer~~layer of shutter means comprises multiple individually switchable ~~light rotating~~ elements, each of said elements being operable in a first mode of operation to ~~substantially~~ prevent passage of light through a portion of said layer, and operable in a second mode of operation to ~~substantially~~ permit passage of light through said portion of said layer;

(d) a control module operable to switch selected elements~~ones~~ of said switchable ~~light rotating~~ elements to said first mode of operation and to switch selected others elements of said switchable ~~light rotating~~ elements to said second mode of operation; and

(e) a calculation module operable to utilize information provided by said eye-locating module to coordinate sizes and positions of said first and second subregions with selection of sets of pluralities of contiguous elements~~ones~~ of said light-rotating elements to be in said first mode of operation and of other sets of pluralities of contiguous elements of said light-rotating elements to be in said second mode of operation, such that light from said first subregions reaches ~~substantially~~ only the left eye of a viewer and light from said second subregions reaches ~~substantially~~

only the right eye of a viewer, the system being adaptable to varying positions of the viewer's eyes.

Claim 16 has been amended as follows:

16. (Amended) A system for three-dimensional viewing of a display, the display presents a frame, the frame includes first subregions and second subregions distributed across and along the frame, the first subregions present picture elements of a left image while at the same time the second subregions present picture elements of a right image, the system comprising:

(a~~b~~) at least one layer of shutter means, which comprises

(i) a first light polarizing sublayer;

(ii) a second light polarizing sublayer; and

(iii) a sublayer of multiple on and off switchable light rotating elements located between said first light polarizing sublayer and said second light polarizing sublayer;

(b~~e~~) a multi-line controlling switching means, each of said multiple switchable light rotating means of each of said sublayer of multiple on and off switchable light rotating means being individually switched on and off by said multi-line controlling switching means; and

(c) a computing element operable to utilize said multi-line controlling switching means to establish within said layer of shutter means first subareas transparent to passage of light and second subareas opaque to passage of light, wherein each of said first and said second subareas comprises a plurality of said on and off switchable light rotating means, said first and said second subareas being

distributed across and along said layer of shutter means in such a manner that light emanating from the first subregions of the display reaches the left eye of a viewer and is blocked from the viewer's right eye, and light emanating from the second subregions of the display reaches the right eye of the viewer and is blocked from the viewer's left eye;

wherein, the system being adjustable to varying positions and distances of the viewer from said display, so as to maintain three-dimensional vision..

Claim 21 has been amended as follows:

21. (Amended) A method for showing stereoscopic three-dimensional images to a viewer, comprising:

(a) utilizing eye-locating apparatus for determining positions of eyes of a viewer with respect to a display;

(b) utilizing computing means to select, based on information provided by said eye-locating apparatus, first subregions of a display for display of picture elements of a left image and second subregions of a display for display of picture elements of a right image, and further utilizing said computing means to select, on a layer of shutter means ~~an optical layer~~ positioned between said viewer and said display and having multiple switchable shutter elements, multiple sets of contiguous elements of said switchable shutter elements to function as said first subareas, and to select multiple sets of other contiguous elements of said switchable elements to function as said second subareas, said first subareas of said ~~optical~~ layer of shutter means to be in a first mode of operation wherein said first subareas are ~~substantially~~

opaque, and second subareas of said optical layer to be in a second mode of operation wherein said second subareas are ~~substantially~~ transparent,

(c~~b~~) displaying picture elements of a left image on said first subregions of said display and displaying picture elements of a right image on said second subregions of said display; and

(d~~e~~) utilizing multi-line controlling switching means controlling multiple switchable light rotating means included in said layer of shutter means~~optical layer~~ to switch said selected first subareas of said layer of shutter means ~~optical layer~~ to said first mode of operation, thereby rendering said selected first subareas ~~substantially~~ opaque, and utilizing said multi-line controlling switching means to switch said selected second subareas of said optical layer to said second mode of operation, thereby rendering said selected second subareas ~~substantially~~ transparent;

thereby creating an optical configuration such that light from said first subregions of said display can be seen by a left eye of said viewer but is ~~substantially~~ blocked from being seen by a right eye of said viewer, and light from said second subregions of said display can be seen by a right eye of said viewer but is ~~substantially~~ blocked from being seen by a left eye of said viewer, thereby providing to said viewer a stereoscopic view of left and right images.